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## Binder 169, Pachypsolidae A-Z [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

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PACHYPSOLIDAE n. fam.

Family diagnosis. — Digenea with medium-sized stout body. Suckers large and muscular. Pharynx present. Ceca with diverticles in forebody. Testes and ovary in anterior part of hindbody, latter anterior to former. Cirrus pouch well developed. Genital pore submedian, pretesticular. Vitellaria follicular, lateral. Uterus occupying posterior part of body. Excretory vesicle Y-shaped, with subdivided lateral branches; arms united anteriorly dorsal to oral sucker. Parasites of reptiles.

Type genus. *Pachypsolus* Looss, 1901.

*Pachypsolus* Looss, 1901

Generic diagnosis. — Pachypsolidae: Body rounded off at two extremities, oval in cross section. Cuticle beset with spines anteriorly. Acetabulum in middle third of body, usually pre-equatorial. Oral sucker subterminal, may be somewhat larger or smaller than acetabulum. Pharynx large and muscular. Esophagus very short. Ceca with simple, branched or terminally subdivided diverticles, or may be merely sinuous in forebody, but simple in hindbody, and terminating at posterior extremity. Testes symmetrical, just medial to ceca or overlapping them a little behind acetabulum. Cirrus pouch cylindrical, long, may or may not extend back of acetabulum, enclosing winding tubular seminal vesicle, long cylindrical pars prostatica, and thick protrusible cirrus. Genital pore anterolateral to acetabulum. Ovary submedian, between acetabulum and

DIGENEA OF REPTILES

487

right or left testis. Receptaculum seminis and Laurer's canal present. Vitellaria extending mostly or entirely in hindbody in lateral or dorso-lateral fields, forming stellate groups in young individuals. Uterus filling up whole posttesticular area, may or may not overreach the ceca laterally. Eggs rather small, numerous. Excretory stem bifurcating a little behind acetabulum; arms forming transverse anastomoses between two suckers. Parasitic in digestive tract of turtles.

Genotype: *P. irroratus* (Rud., 1819) Looss, 1901 (Pl. 59, Fig. 713), syn. *P. lunatus* Looss, 1901, in *Caretta caretta* and *Chelonia mydas*; Atlantic, Mediterranean, Pacific.

Other species:

*P. brachus* Barker, 1922, in *Chelonia imbricata*; near Bermuda Islands.

*P. ovalis* Linton, 1910, in *Caretta caretta*; Dry Tortugas, Panama.

*P. sclerops* (Travassos, 1922) Travassos, 1928, syn. *Gastriis* s. T., in cloaca of *Caiman sclerops*; Brazil.

*P. tertius* Pratt, 1914, in *Caretta caretta*; Florida. Syn. of *P. ovalis* Linton, 1910 — Caballero, Zerecero and Grocott (1955).

*Pachypsolus brachus*, n. sp. **Barber, 1922**  
(Pls. I and II, Figs. 1-8, 12).

1. MORPHOLOGY.

**General Appearance.**—The description of the following species is based on the study of 27 preserved specimens, 11 of which were killed and fixed in 2% formal and 16 in vom Rath's osmio-sublimate mixture. Little difference can be seen as a result of the different killing reagents other than in color. Specimens fixed in formal are grayish-yellow, those fixed in vom Rath's fluid black. A detailed study has been made of specimens in toto, both unmounted and mounted, and of series of frontal and sagittal sections.

The body is oval and plump (Pl. II, Fig. 8), being one half as thick as wide. The length varies from 3 mm. to 3.7 mm., the mode being 3.2 mm., which is the length of 50 per cent of the individuals. The width varies from 1.5 to 1.9 mm., the mode being 1.7 mm., which is the width attained by 60 per cent. The ends are bluntly rounded,

the anterior end slightly more tapering than the posterior. In the median line at the posterior end is a well defined terminal invagination, which marks the position of the excretory pore. The dorsal surface of the body is strongly arched, the ventral surface slightly cupped. The sides are nearly parallel with the exception of a wide, shallow constriction midway between the ends at the level of the acetabulum. Spines or scales were not found anywhere on the body.

In the preserved specimens, the anterior third of the body shows a marked and constant tendency to flex ventrad, which gives rise to a well defined and rather deep ventral cup between the oral and ventral suckers. This cup-like depression persists in compressed specimens and possibly functions as a secondary holdfast (Pl. II, Fig. 8).

The oral sucker is comparatively large, well defined, nearly circular in line and ventral in position, with its dorso-ventral axis at right angles to the chief axis of the body. In compressed specimens the oral sucker is 0.80 mm. to 0.82 mm. wide by 0.66 mm. to 0.82 mm. long. In frontal sections it measures 0.82 mm. wide by 0.82 mm. long. The ventral sucker, or acetabulum, lies in the median area at the posterior margin of the anterior half of the body and faces obliquely cephalad. It is of approximately the same size and shape as the oral sucker. It measures 0.60 mm. to 0.74 mm. in length by 0.70 mm. to 0.74 mm. in width in compressed specimens and 0.72 mm. by 0.80 mm. in frontal sections.

The genital pore is not salient and lies in the median line, at the anterior margin of the acetabulum, or else slightly to the left of, and just anterior to the acetabulum.

In the middle quarters of the body (Pl. I, Fig. 2), along the sides, and extending well toward the median line on the dorsal surface, can be seen the characteristic dark colored, convoluted tubular and finely annular vitelline glands in moss-like patches. The uterus appears as a dark coiled mass nearly filling the ventral field of the posterior third of the body.

**Digestive System.**—The transversely oval mouth leads into the angular lumen of the oral sucker, which is 0.90 mm. deep in sagittal sections with thick muscular walls. A thick walled, large and powerful cup-shape pharynx follows immediately (Pl. II, Fig. 12). The pharynx measures 0.58 mm. long by 0.52 mm. wide by 0.44 mm. deep in sagittal sections. Eight longitudinal muscular ridges or folds project from the inner wall of the anterior two thirds of the pharynx to its lumen. Of the four larger or primary ridges, one is dorsal, one ventral, and two lateral; alternating with these are four smaller

nearly to the distal end of the pouch. Fine ducts leading from the prostate cells occupy the medullary portion of the pouch and enter the prostatic duct. The lumen of the cirrus is lined with cuticula, while the lumen of the prostatic duct is covered with high filamentous papillae.

The wall of the cirrus pouch possesses a heavy outer sheet of longitudinal muscle fibers and a thin inner one of circular fibers. The cirrus, which is approximately one-fifth the length of the cirrus pouch has an outer and an inner muscular component. The outer component comprises an outer sheet of longitudinal muscle fibers and a heavier inner sheet of circular fibers. The inner muscular component immediately surrounds the lumen of the cirrus and the prostatic duct and is likewise composed of an inner sheet of circular muscle fibers and an outer sheet of longitudinal fibers. The cirrus pouch is anchored and possibly controlled by a pair of oblique muscles which are attached respectively to the cephalic and caudal faces of its base.

The cirrus opens into a common genital atrium, which has its outlet in the genital pore lying in, or a little to the left of, the median line and slightly anterior to, or just under, the anterior margin of the acetabulum.

**Female genitals.**—The ovary (Pl. I, Figs. 1, 5, 6, Pl. II, Fig. 7) lies near the middle of the body, in the median area, dorsal to the posterior portion of the acetabulum and is from one-half to two-thirds the bulk of one of the testes, globular in general form with undulating or slightly lobed outline. In the specimen figured (Fig. 5) it measured 0.38 mm. by 0.38 mm.

The oviduct leaves the ovary from the middle of its anterior margin and at once turns sharply mediad; after making several loops it passes caudad in descending transverse coils, lying a little to the right of the median plane, to the end of the body, where, turning, it winds cephalad, a little to the left of the median plane, in ascending transverse coils; the terminal portion passes between the testes and thence to the left and dorsally over the acetabulum; finally it turns to the right and crosses obliquely the distal third of the cirrus pouch (Pl. I, Fig. 3), where it enters a well defined metraterm or vagina. The base of the metraterm is enlarged and lies across the left side of the terminal portion of the cirrus pouch, but the neck parallels the pouch and terminates anteriorly and to the left of the pouch in the common genital atrium. The wall of the metraterm is thickened and supplied with an inner sheet of circular muscle fibers and an outer sheet of longitudinal fibers. An invagination of the cuticula appears to form the lining of its lumen, the wall of which is transversely ridged.

A diffuse, but well defined, shell-gland (Pl. I, Fig. 6), or gland of Mehlis, lies dorsal, and for the most part anterior, to the ovary. Its posterior portion covers the anterior third of the ovary. The oviduct penetrates the mass of shell-gland cells, which are connected with the oviduct by numerous minute ducts.

A globular compact receptaculum seminis (Pl. I, Figs. 1, 5, 6), one-third the bulk of the ovary, lies dorsal to the shell-gland and the anterior half of the ovary. A small duct leaves its anterior margin and turning mediad joins the oviduct soon after it leaves the ovary.

At the junction of the receptaculum duct with the oviduct a tubular Laurer's canal (Fig. 6) originates and in a slightly undulating course makes its way dorsad and opens on the dorsal surface of the body dorsal to the ovary and the posterior part of the acetabulum and slightly to the right of the median line.

The vitellarium (Pl. I, Figs. 1, 2, 5) is rather striking in appearance and is composed of two masses of convoluted tubules grouped in moss-like patches, which lie in the lateral and latero-dorsal fields in the middle three-fifths of the body. The patches are fairly definite and constant in number, three patches being present on the right and four on the left side. They extend forward of the anterior margin of the acetabulum a distance approximately half of the diameter of that organ, the posterior limit being about mid-way between the testes and the posterior end of the body. The latero-dorsal patches are dorsal to the testes and uterine coils. A fine vitelline duct (Pl. I, Fig. 6) connects with each other the patches or groups of each side and a larger vitelline duct leaves the central group of each side and passes transversely mediad to unite with the one from the opposite side to form a small, but distinct, vitelline reservoir, which lies dorsal to the left margin of the ovary. From the reservoir a small duct leads cephalad and joins the oviduct a short distance beyond the union of the receptaculum duct with the oviduct.

The eggs (Pl. I, Fig. 4) are numerous, spindle shaped, light brown in color, with thick shell. A comparatively large, well-defined and easily separated operculum is present, and a slight opercular rim can be detected. The opercular pole is the more pointed. The eggs measure 0.0375 mm. to 0.0450 mm. in length by 0.015 mm. to 0.020 mm. in width. The older eggs contain a well developed embryo, but many appear empty, which probably indicates a non-fertile condition.

**Excretory System.**—The excretory system (Pl. II, Fig. 7) is voluminous and consists of an enormous median dorsal reservoir, with a pair of anterior prolongations. The reservoir is one-fourth the width and one-half the depth of the body, and extends from the posterior end of the body to the posterior margin of the ovary, where it bifurcates, one arm passing to the left and one to the right of the ovary; the arms extend cephalad around the oral sucker to the anterior end of the body. The reservoir and arms give off numerous long lateral and deep ventral diverticula, but these do not anastomose. The reservoir terminates behind in a short narrow median canal at the posterior end of the body, which ends in a well-defined excretory pore, terminal in position and nearer the ventral than the dorsal surface. The short excretory canal appears to be lined with cuticle. The entire excretory system is filled with a mass of fine globular, gray and golden, listening particles among which are numerous larger globular bodies which stain a bright blue with methylen blue.

## 2. TAXONOMY.

Braun (1901, p. 36) described under the name of *Distomum irroratum* R. a trematode found in the intestine of a sea turtle, *Thalassochelys caretta*, from New Guinea, which has a number of characters similar to the trematode described in this paper. Looss (1901, p. 558) described a similar trematode found in the stomach of a sea turtle, *Thalassochelys corticata*, from Trieste, which he named *Pachypolus unatus*. In a later paper Looss (1902, p. 485), after a careful comparative study of new adult specimens, as well as the forms described by Braun and by himself, reached the conclusion that all were specimens of *Distomum irroratum* Rudolphi, those described by Braun and by himself in his earlier paper being young forms, while those studied by himself later were mature. He accordingly classified all of them as *Pachypolus irroratus* (R.).

Looss (1902, p. 503) gives the following characters for the genus *Pachypolus*, "Mittelgrosse Distomen mit sehr kräftigem, dickem, vorn und hinten abgerundetem, auf dem Querschnitte kurz ovalem Körper. Saugnäpfe gross und kräftig. Haut besonders im Vorderkörper mit scheinbaren Bündeln feiner stäbchenartiger Stacheln bewaffnet. Darm mit starkem Pharynx, ganz kurzem Oesophagus und Darmschenkeln, die bis auf einige von ihren Anfangstheilen nach vorn abgehende Blindsäcke einfach sind. Excretionsblase Y förmig, mit bis zum Keimstock reichendem Stamme und bis ins Kopfende sich erstreckenden Schenkeln. Stamm und Schenkel mit trässig zahlreichen, weiten und zum Theil wieder gespaltenen Seitenzweigen, die nach der Bauchseite hinabsteigen mit Ausnahme des vordersten Paares, welches über dem Mundsaugnäpfe eine einfache Queranastomose der Schenkel bildet. Genitalporus etwas linksseitig von dem Bauchsaugnäpfe, Copulationsorgane vorhanden. Cirrusbeutel cylindrisch, von beträchtlicher Länge, in seinem Innern eine mehrfach gewunden, schlanke Samenblase, lange, cylindrische Pars prostatica und dicker Penis, der sich im ausgestülpten Zustande nach seiner Spitze zu merklich verjüngt. Hoden stark seitlich hinter dem Bauchsaugnäpfe. Keimstock seitlich vor ihnen; Laurer'scher Canal und Receptaculum seminis vorhanden. Dotterstöcke in den Seiten und unter der Rückenfläche, aus in der Jugend deutlich sternförmigen Follikelgruppen zusammengesetzt. Uterusschlingen hauptsächlich hinter den Hoden die ganze Breite des Körpers ausfüllend und nur die Enden der Darmschenkel freilassend. Eier zahlreich, klein, mit zugespitztem Deckelpol und dickem Hinterende, zwischen 0,04 und 0,05 mm. lang. Bewohner des Magens von Seeschildkröten. Typus: *P. irroratus* (R.)."

The trematode from *Chelonia imbricata* which I have described has in general, the characters of the genus *Pachypolus*, and I do not hesitate to place it in that genus. When compared with the trematodes described by Braun and Looss under the name *irroratus* several essential differences are evident. Externally the following may be noted. The absence of spines, or scales, which may, however, have been lost, the very large and more nearly equal size of the suckers, the ventral cup-like depression and the non-salient genital pore. Internally, the position of the testes and ovary nearer the acetabulum and the less diffuse arrangement of the vitelline masses, which are more nearly like those described by Braun, may be noted. The most striking and essential difference, however, is the size and position of the cirrus pouch, which in *Pachypolus irroratus* (Pl. II, Fig. 11) bends around the acetabulum, its posterior end extending to the level of, or posterior to, the ovary, while in the form here described (Pl. I, Fig. 3) the cirrus pouch is much shorter, parallel with the dorso-ventral axis of the body and entirely anterior to the acetabulum.

Linton (1910, p. 24) has described a new species, *Pachypolus ovalis*, found in large numbers in the intestine of a Loggerhead Turtle (*Caretta caretta*) from the Tortugas. A third species, *Pachypolus tertius*, has been described by Pratt (1914, p. 416) from the small intestine of the same host and of the same locality. The species described by Linton and by Pratt differ from *P. irroratus* in minor points and distinctively in the position and extent of the cirrus pouch. Pratt (1914, p. 418) describes the cirrus sac in *P. tertius* (Pl. II, Fig. 9)

as "a long cylindrical structure, extending from the genital pore around the dorsal side of the acetabulum to the vicinity of the ovary and the shell-gland, and in some cases to the anterior border of the testes." According to Linton (1910, p. 25) the cirrus pouch in *P. ovalis* (Pl. II, Fig. 10) is "relatively short, reaching barely to the posterior edge of the acetabulum." Both Linton and Pratt consider the differences in the extent of the cirrus pouch, together with other minor differences, to be of specific rank. It is evident that the form which we have described resembles *P. ovalis* Linton more than it does *P. tertius* Pratt or *P. irroratus* (R.) Looss; but it differs from *P. ovalis* Linton in minor characters and distinctively in the position and lesser extent of the cirrus pouch. The difference in the length of the cirrus pouch in *P. ovalis* Linton and in the trematode here described is greater than that between *P. ovalis* and *P. tertius* Pratt and decidedly greater than that between *P. tertius* Pratt and *P. irroratus* (R.) Looss. We agree with Pratt that the "actual position is undoubtedly dependent upon the condition of contraction," but it seems improbable that this constant and marked difference could be due entirely to the contraction of the acetabulum or the body.

We feel warranted in ascribing to this difference in the position and extent of the cirrus pouch, taken together with the minor differences noted, a specific value, and therefore class this trematode as a new species in the genus *Pachypolus*, designating it as *Pachypolus brachius*.

In the four species of *Pachypolus* now recorded we find, in addition to differences of secondary importance, a striking gradation in the position and size of the cirrus pouch, which is the distinctive specific character. The old question, raised by Looss, arises as to specific differences and the specific effects of different hosts on the same species.

From the standpoint of geographical distribution, it is of interest to find in the Hawk's-bill Turtle from the Bermudas a different species of *Pachypolus* from that found in the Loggerhead Turtles of New Guinea and the Mediterranean and from those found in the Loggerhead Turtles of the Tortugas.



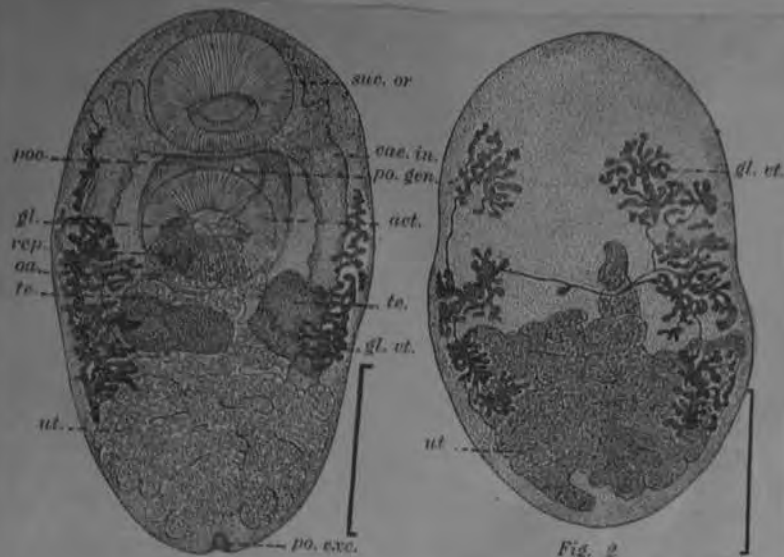


Fig. 1

Fig. 2



Fig. 7

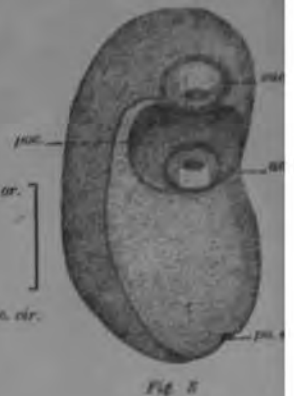


Fig. 8



Fig. 9

JTB del.



Fig. 5

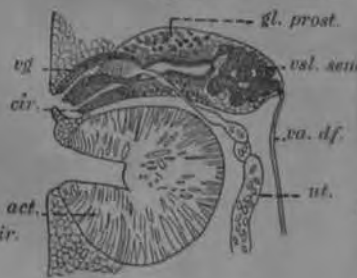


Fig. 3



Fig. 4



Fig. 6

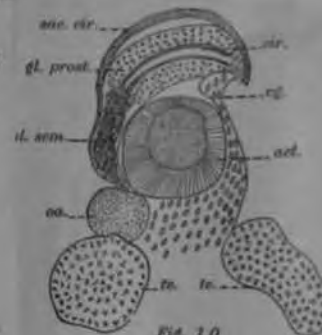


Fig. 10



Fig. 11



Fig. 12

JTB del.

Pachypsolus sclerops (Trav., 1922) Trav., 1929

Host: Caiman fuscus (Cope); cloaca ; Panama

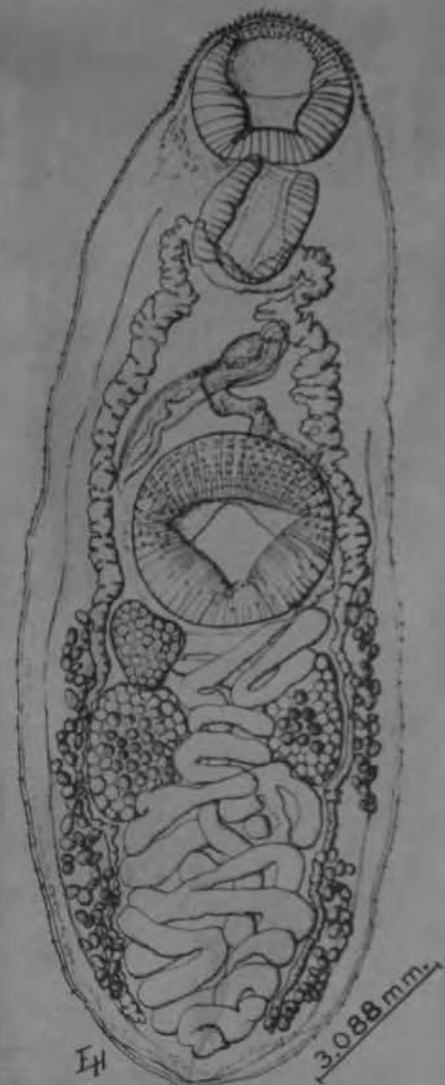
from Caballero (1956)

*Pachypsolus sclerops* (Travassos, 1922) Travassos, 1929

El ejemplar que se describe aquí mide 3.088 mm. de largo por 1.145 mm. de ancho a nivel de su porción más amplia: el cuerpo es ancho, de extremos redondeados, el posterior lo es más que el anterior; la cutícula mide 0.008 mm. de espesor, y lleva espinas semejantes a escamas que miden 0.008 mm. de largo por 0.002 mm. de ancho y se extienden a todo lo largo del cuerpo, siendo más abundantes en la parte anterior. La ventosa anterior es grande, casi esférica, musculosa, y mide 0.415 mm. de largo por 0.465 mm. de ancho; el acetábulo es muy grande, mayor que la ventosa oral esférica, está situado en el ecuador del cuerpo del animal, a 1.179 mm. del extremo anterior, y mide 0.564 mm. de largo por 0.598 mm. de ancho; la relación entre el acetábulo y la ventosa oral es  $1.43 \times 1.12$ . La boca es terminal, amplia, y mide 0.163 mm. de largo por 0.304 mm. de ancho; la faringe es robusta, de diámetro antero-posterior mayor que el transversal, fuertemente musculosa, y mide 0.342 mm. de largo por 0.289 mm. de ancho; no hay prefaringe ni esófago; los ciegos intestinales son de trayectoria sinuosa, se pliegan alrededor de la mitad posterior de la faringe y forman un collar con paredes que poseen cortos divertículos, y el resto de los ciegos es de paredes lobuladas, se extienden hasta cerca del borde posterior del cuerpo y miden 0.095 mm. de ancho.

El poro reproductor se encuentra situado sobre el lado izquierdo del cuerpo, por detrás de la bifurcación intestinal, sobre el borde interno del ciego intestinal del mismo lado, como a la mitad de la distancia entre el borde posterior de la faringe y el anterior del acetábulo, y dista 0.863 mm. del borde anterior del cuerpo; los testículos están situados en la mitad posterior del cuerpo por detrás del acetábulo, lateralmente uno en frente del otro, ligeramente oblicuos, en la zona intercecal, son

AN. INST. BIOL. MEX., XXVI, 2, 1955



Pachypsolus tertius Pratt 1914

4 specimens from 1 of 2 loggerhead turtles

Other species: P. irroratus (R.) from same host Mediterranean  
P. ovalis Linton from same host, Tortugas

Body elliptical, 5. mm. by 1.4 mm. Outer surface seemed to be smooth but spines are characteristic for the genus. Suckers large, oral sucker larger: 750 $\mu$ . Ventral sucker 550 $\mu$ /Pharynx 400 by 350  $\mu$ / Esophagus very short, ceca wide, to posterior end. Projecting from forward portion of each cecum are three long branched, blunt diverticula of about same diameter of the cecum, and just back of them are two or three slight protuberances of the outer wall. The presence of three instead of two diverticula makes this species different from P. irroratus.

Excretory vesicle Y-shaped, containing dark concretions, conspicuous, forks at level of ovary., branches unite over the oral sucker.

Genital pore just in front of ventral sucker, to the left but near the median line. Closer to ventral sucker than in P. irroratus.

Testes large, more or less spherical, near the middle of the body symmetrical, larger than in either of the other species. Cirrus sac long, cylindrical extending posterior to the ventral sucker to the region of the ovary and shell gland, in some cases to anterior border of testes. Shorter than in P. irroratus, longer than in P. ovalis. Posterior half contains convoluted seminal vesicle, anterior half mostly prostate gland. Cirrus short.

Ovary spherical, dorsal, right, between ventral sucker and right testis. Sem. rec. small, dorsal, between ovary and v.s.

Much smaller than in P. irroratus. L. canal long, convoluted.

Vitellaria from anterior position of ventral sucker to a point about  $\frac{1}{2}$  between testes and posterior end. Less extensive than in P. irroratus. Numerous small follicles, arranged in indistinct groups on each side of body.

Uterus passes between testes to fill the hind body, ascending on left side in closely packed coils. Metraterm present.

Eggs 45 by 18 $\mu$  without the pointed tip of P. irroratus

P. ovalis is about  $\frac{1}{2}$  the size of this species and has a smaller uterus and smaller testes. Absence of scales in P. tertius May or may not be accidental

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PACHYPSOLUS